

Book Review

Ten Technologies to Save The Planet

Kaihsu Tai

University of Oxford, Oxford OX2 1XQ

kaihsu.tai@bioch.ox.ac.uk

Chris Goodall (2008) *Ten Technologies to Save the Planet*. London: Green-Profile. ISBN 978-1-84668-868-3.

A friend who has the job of raising public awareness about climate change once told me: As soon as you mention percentages and the centigrade to a typical audience, you have lost them. But there is another school of popular science outreach, a proponent of which is the late Professor Paul Saltman of San Diego. He insisted that (for example) it is not enough for public nutrition campaigns to put food into groups and count dietary portions, but that people need to be taught about metabolism – about the hard science.

Responding to current concerns about climate change and energy security, an optimistic version of this kind of hard science can be found in *Ten Technologies to Save the Planet*, billed as a popular science book on a hot topic. The author Chris Goodall, not a scientist by training but an alumnus of Harvard Business School, demonstrates herein an often neglected but essential trait in any hard-nosed businessperson: an understanding of basic laws of nature. An entrepreneur, upon encountering a patent document, should be knowledgeable enough to ask (and likely to answer) the question: Does this invention violate the second law of thermodynamics? Goodall's lifelong interest in science, kindled by devoted school teachers, is thus put to good use, distinguishing the specious hype from the scientific advances that can contribute in mitigating or adapting to the effects of climate change.



To enumerate the eponymous items: wind, solar, maritime energies, combined heat and electricity, super-efficient homes, electric cars, cellulosic biofuels, carbon capture and storage, biochar, and agricultural/forest carbon sinks. In the discussions about the first few items, the fact that electricity is a more versatile form of energy than heat or fossil fuels is heavily relied upon. As technologies for the storage of electricity improve, a fleet of electric cars can take the central role in a renewable-electricity economy/ecology: doubling as storage devices to soak up electricity when demand is low, and to provide the baseload at other times.

The vision of such an economy/ecology cannot come into existence without large-scale infrastructural investments; for example, a Europe-wide grid

that balances out fluctuations among wind, maritime, and solar generation of electricity. For this last source of energy, two main contenders are discussed: photovoltaic and concentrated solar power (CSP). The second one, perhaps lower-tech but better-proven than its companion, is a patently economical technology. The Spanish company Abengoa are building a CSP power station in Algeria, using parabolic troughs to concentrate sunlight for electricity. This technology can equally apply to other Maghreb countries. In the Mashreq, it already has powerful backers such as Prince Hassan bin Talal of Jordan. Both Africa and Europe can draw the most benefit from this by installing high-voltage direct current transmission lines under the Mediterranean, between these two continents.

Closer to home, Goodall considers developments of super-efficient buildings in Europe. He notes that only a small fraction of houses are replaced every year. To make a difference in the collective energy and carbon bills, the current housing stock needs to be upgraded, in addition to zero-emission new-builds. German ingenuity has brought about the Passivhaus (passive house) movement, which taught us that high-precision construction methods, such as prefabrication of houses, are 'the easiest way to achieve the standards' of energy efficiency required; but Goodall notes sadly that prefabrication is still 'anathema in places like the UK'. One cannot but feel that here, it is not the lack of technology that is the barrier, but sociology and politics; more on this at the end.

Unlike most commentators from the

green camp, Goodall does not treat carbon capture and storage (CCS) as a distraction from investment in real renewables, but puts it in this top-ten list. This enthusiasm relies on the premise that the carbon dioxide captured can be injected into aquifers 'to form very stable carbonates' that cannot escape. Goodall admits that this storage strategy, along with the capturing mechanism, requires more research. Indeed, any instability of storage will be the deal-breaker in the case for CCS. Still, there has been no rush on the power industry's part to invest in research and development of CCS: even the planned Kingsnorth coal-fired plant is only set to be CCS-ready, not CCS-now.

Moving from artificial carbon sinks to biosphere ones, Goodall gives zero-till cultivation 4 pages' worth of spotlight. He reports: 'Over 20 per cent of American farmlands are now avoiding the plough, and the figure is even higher in Brazil and Canada.' The late author and smallholder John Seymour argued against this practice. As he said in his classic *The New Complete Book of Self-Sufficiency*: 'No-diggers and no-ploughers have great success, provided they have very large quantities of compost or farmyard manure with which to mulch their land. ... The idea of very heavy mulches is fine – providing you can get the compost. But the land itself will never produce enough vegetable material to make enough compost to cover itself sufficiently deeply and therefore you will have to bring vegetable matter in from outside.'

Though the Earth is much larger than a smallholding, it is not immune from the law of the conservation of atoms. The zero-till farmlands in the Americas, if Sey-

mour was correct, must bring in fertilizers from 'outside'. Where is this 'outside'? It is likely to be the fossil-fuel-based, carbon-intensive processes making fertilizers such as the Haber-Bosch. If true, zero-till farmlands may be devastating net carbon emitters rather than agricultural carbon sinks. This is not taken into account in Goodall's cost-benefit analysis.

Perhaps off-message for a parliamentary candidate of the Green Party of England and Wales, whose manifesto fundamentally opposes any nuclear energy, Goodall keeps an open mind about nuclear fission. Braving criticism from within his party, he hints in the Epilogue that it, along with geoengineering, might be in the running as the Eleventh Technology. But he is in no way romantic about the technology; rather, he subjects it to a detailed cost-benefit analysis. He reckons that building any new nuclear plants would only be borderline economically competitive, if at all; and it runs the risk of adversely competing with investments in real renewables. The money can be much better spent elsewhere.

Unlike Goodall's first book, *How to Live a Low Carbon Life* (2007), this book does not have any footnotes. Perhaps in this age of web searches, these are considered by the publisher to be devices too Victorian for a popular science book. However, the more academically-inclined reader may feel frequently frustrated that the data cited, some critical in distinguishing the usefulness of a certain technology, are not rigorously referenced.

On a more general note, shall we trust that technologies alone can save the planet? Though Goodall thinks they will play a

large role, in an interview with the Environment Agency (United Kingdom) in 2007, he said, '[The different faith groups] need to form a coalition to encourage their followers to set an example to the rest of the population.' And this reviewer agree with him, who attends St Margaret's Church in the neighbouring parish in Oxford, that nothing short of precisely a collective change of heart will bring salvation.

As a popular science book, this is an exciting read that can be finished in a long weekend. Whether a lily-hearted parent worried about college fees, pension schemes and the future of generations to come, or a dyed-in-the-wool capitalist investor trying to squeeze a buck out of the climate-change lemon, this book will give the reader plenty to brood over: maybe when building a conservatory in the back of the house, or when calling the stockbroker next Monday. All the while, this book reconnects the reader to the reality of things: that there are just that many joules about – there is no way around it; and that either the carbon stays in the ground, or it goes up into the atmosphere to heat us all.

And, at the ballot box, what should be in the front of the reader's mind? At the end of the book, Goodall issues an exhortation which this reviewer wants to echo: 'We need to vote for governments that are prepared to take the somewhat painful measures, today, to permanently reduce our need for fossil fuels. Politicians who argue that climate change is too expensive to solve must be rejected – urgently.' The United States of America has done so; it is the turn of the European electorates to do the same in June 2009.

Kaihsu Tai, January 2009